

ANALYSIS AND DECISION OF THE DIRECTOR  
OF THE  
DEPARTMENT OF DESIGN, CONSTRUCTION AND LAND USE  
Technical Noise Variance 2003-01

**Application:** Request for a technical variance from the maximum permissible sound level requirement of the Noise Control Code, Seattle Municipal Code (SMC) Chapter 25.08 during construction of the Beacon Hill light rail tunnel and station.

**Applicant:** Central Puget Sound Regional Transit Authority (Sound Transit)

**SUMMARY OF PROPOSED ACTION**

The proposed action is one part of Sound Transit's Beacon Hill Tunnel and Station Contract. The contract is a component of the 14-mile initial segment, which was adopted by the Sound Transit Board in 2001. The Beacon Hill corridor of the light rail project extends from the west of Airport Way South near its intersection with South Forest Street to the east of 26<sup>th</sup> Avenue South near its intersection with South McClellan Street. Tunnels for Beacon Hill Station will be excavated through soils and perched water tables, working from the shafts located on the Beacon Avenue-Lander Street construction staging area. The running tunnels will be excavated by a tunnel boring machine from west to east through the soils of Beacon Hill from a staging area west of Interstate 5. To support the tunneling, excavation, and underground construction activity in the manner proposed by the applicant a certain amount of surface activity is necessary.

A technical variance is requested as specified in SMC 25.08.590, 25.08.620 and 25.08.640 to exceed the maximum permissible sound level during nighttime hours (between 10:00 p.m. and 7:00 a.m. on weekdays and between 10:00 p.m. and 9:00 a.m. on weekends and holidays) as specified in SMC 25.08.410 and 25.08.420.

This variance applies only to the tunneling, excavation, underground construction activity and surface activity to support those operations. As noted below, this variance does not apply to construction of structures above ground such as the Beacon Hill station surface structures and much of the preliminary work at the East Portal site.

The duration of the requested variance is from the beginning of construction in 2004 through construction completion, estimated to be in 2008.

**BACKGROUND**

It is the express intent of the City as expressed in the Noise Control Code to “control the level of noise in a manner that promotes commerce; the use, value, and enjoyment of property; sleep and repose; and the quality of the environment.” SMC 25.08.010.

The Department of Design, Construction and Land Use (DCLU) held public hearings on May 29 and June 4, 2003 to take public comment on the variance application. Comments and letters from citizens and local groups, both opposing and supporting the variance application were received and considered. Comments on the variance application were considered only in relation to the noise impacts of the proposed activity. Notice of the meetings was published in several newspapers and mailed to residents in the vicinity of the proposed construction.

SMC Section 25.08.590 provides, in part, as follows:

“No variance shall be granted...until the Administrator has considered the relative interests of the applicant, other owners or possessors of property likely to be affected by the noise, and the general public... The Administrator may grant a variance, if he finds that:

- A. The noise occurring or proposed to occur does not endanger public health or safety; and
- B. The applicant demonstrates that the criteria required for...technical...variance ...are met.”

The requirements for a technical variance are contained in SMC Section 25.08.640 as follows:

“A technical variance may be granted by the Administrator on the ground that there is no practical means known or available for the adequate prevention, abatement or control of the noise involved. Any technical variance shall be subject to the holder’s taking any alternative measures that the Administrator may prescribe. The duration of each technical variance shall be until such practical means for the prevention, abatement or control become known or available. The holder of a technical variance, as required by the Administrator, shall make reports to the Administrator detailing action taken to develop a means of noise control or to reduce the noise involved and must relate these actions to pertinent current technology.”

The applicant has, in written materials, indicated that there is no practical means known or available for the adequate prevention, abatement, or control of the type of noise inherent in the construction of the tunnel, excavation of shafts and related surface support work necessary to perform the construction as safely as possible and to minimize surface settlement. In their application materials the applicant provides examples of construction activity which require continuous work for the activities to be performed in a safe and efficient manner.

The applicant has also stated that there are other general public benefits of the variance including: an earlier completion of the project which will bring public transportation and other benefits to the populations served by the light rail line and substantial cost savings to the public. The applicant also points out that some of the mitigation actions taken at the Beacon Hill Station site and the two tunnel portals, such as the noise barrier wall will also provide a benefit during daytime hours of construction and would not otherwise be required by the code.

The applicant has also submitted written materials that outline a Construction Noise Control and Monitoring Plan. The plan includes prescriptive specifications for noise control at the construction sites requiring the applicant's contractor to implement measures to establish compliance with the nighttime noise limits established in the variance application. The purpose of this plan, as stated by the applicant, is to allow necessary surface-level support work to continue for the tunneling and excavation operations while ensuring that the public and those likely to be affected by the noise will be protected, and that noise impacts from the work will be minimized.

The applicant identified the population likely to be affected by the nighttime noise, presented data on existing sound levels and projected construction sound levels, reviewed health effects of noise, gave sound levels for specific activities or equipment and, as noted above, outlined required noise mitigation proposals to be followed by the contractor.

Comment from the public was generally supportive of the concept of the tunnel and station. Several people did state that they are concerned about the nighttime noise and particularly noise associated with trucking activities performed in support of the construction. The possibility of potential ill effects on residents in the area was mentioned in several letters received by the Administrator. Those ill effects included potential loss of sleep or interference with sleep and a general degradation of the quality of life experienced by nearby residents.

DCLU retained the services of Bruck Richards Chaudiere Inc. (BRC Acoustics) to assist in reviewing and analyzing the variance application. BRC Acoustics took noise level measurements to confirm the accuracy of the information provided in the application concerning ambient noise levels as well as performing other analytical tasks.

## **FINDINGS**

In accordance with DCLU Director's Rule 21-99 the following conditions and other procedural matters were considered in reviewing the application.

### **1. Area affected by the variance**

This variance decision and its conditions apply only to the tunneling, excavation and related surface support work necessary to complete the underground portion of

construction activities associated with the Beacon Hill Tunnel and Station contract. Three specific construction sites are included: the East and West running tunnel portals and the Beacon Hill Station and shaft. The areas are described above and in more detail in the application materials which are attached hereto as Attachment “A” and incorporated herein by this reference.

## 2. Notice

At least twenty (20) days prior to the May 29 and June 4, 2003 public hearings for this proposed variance proper notice was filed with the Daily Journal of Commerce and the Beacon Hill News. At the same time notice was given to local community councils and mailed to residents within three hundred (300) feet of the sound sources covered by the application and also to the Sound Transit public meeting notice area.

## 3. Physical Characteristics of the emitted sound

The applicant took measurements of existing ambient noise levels at sixteen (16) sites identified as representative of nighttime noise sensitive land uses close to each construction site during the period of July 26 through August 21, 2002 and January 8 through 11, 2003. The results are set forth in Table 2-1 of the application. BRC Acoustics took measurements at three of the sixteen sites in January 2003. For the sites measured by BRC Acoustics the differences in existing ambient noise levels were not significant. In the one instance where the difference was 3 dBA, that difference is likely attributable to BRC Acoustics taking measurements from the second floor of the building and the applicant’s measurements being taken from the ground floor. BRC Acoustics concluded that the applicant’s information concerning existing noise levels and land uses in the vicinity of the construction sites is accurate. The existing noise levels are due primarily to traffic on nearby local streets and Interstate 5. In the Beacon Hill Station area of the project aircraft flyovers are also part of the existing noise levels.

Measurements indicate that current hourly ambient nighttime sound levels (measured from 12 a.m. to 5 a.m.) at the sixteen sites selected by the applicant range from 50 dBA to 64 dBA Leq. The variance application seeks to exceed the existing ambient noise levels on a sliding scale from 0 dBA to 5 dBA as set forth in Table 4-2 in the application. At sites where the existing ambient noise level is between 50 and 60 dBA an increase of 5 dBA is sought. At sites where the existing ambient noise level is between 61 and 65 dBA an increase of 4 dBA is sought. As the existing ambient noise levels increase the amount of increase sought decreases and is fully set forth in Table 4-2 and incorporated herein by this reference.<sup>1</sup>

Construction of the Beacon Hill running tunnels will be by tunnel boring machine.

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<sup>1</sup> Table 4-2 appears to allow an increase of 6dBA above existing ambient noise levels at receiver location BH2. The Administrator has been informed that this is a typographical error and is changed for the purposes of this decision to 5dBA. The same change is incorporated into Table 2 of Appendix B for purposes of this decision.

Construction of the Beacon Hill Station large-sized tunnels, shafts, and tunnel/shaft intersections will be carried out by sequential excavation method mining working from the station shafts. Although noise generated by the tunnel boring and sequential excavation method mining operations should not be noticeable at the surface, surface support operations for the underground construction will require use of noise-producing heavy equipment.

Work at the three construction sites will include noise-producing heavy equipment such as backhoes, bulldozers, muck trains, cranes, concrete mixers and batch plants, dump trucks and loaders, as well as smaller equipment such as air compressors, electrical generators, and ventilation fans.

The major construction activities that are expected to occur at the West Portal site during the nighttime hours are as follows:

- earthwork and concrete construction;
- assembly of tunnel boring machine;
- removal of excavation spoils from the tunnel by muck train;
- supply of precast tunnel segments to the tunnel;
- loading of excavation spoils onto trucks or rail cars for transport to disposal site;
- trucks and trains entering and leaving the construction site;
- continuous operation of ventilation fans, air compressors, dewatering pumps, and diesel electric generators; and
- unloading of materials delivered by truck or train.

The major construction activities that are expected to occur at the Beacon Hill Station site during the nighttime hours are as follows:

- underground shaft, station, and tunnel excavation and concrete construction;
- hoisting of spoils from station excavation up through the elevator shaft by crane lifted bucket;
- unloading of excavation spoils on site in a storage pile for removal by truck;
- continuous operation of ventilation fans, air compressors, dewatering pumps, and diesel electric generators; and
- lowering of materials through the elevator shaft by crane to the station.

At the East Portal site, demolition of existing structures, excavation, embankment wall construction, and cut and cover construction will be performed during daytime hours and are not included in the variance application. After arrival of the tunnel boring machine at the east tunnel portal, the following construction operations are expected to occur at the East Portal site during nighttime hours:

- access and supply to tunnel excavation (cross passages only) and concrete tunnel construction;
- disassembly and removal of the tunnel boring machine; and

- access for civil and systems finish work within the tunnels.

Table 3-1 of the application (which is included in Attachment “A”) describes the construction activities, approximate duration of activities and the equipment expected to be used in conducting the activities.

Amended Tables 4-4, 4-5, and 4-6 of the application which are attached hereto as Attachment “B” and incorporated herein by this reference, estimate the mitigated and unmitigated nighttime construction noise level at the three construction sites and sixteen receiver locations. The tables indicate that in most cases the required mandatory noise control measures proposed by the applicant will bring the noise levels within the range sought in the application. At some of the sites the estimated nighttime construction noise levels would exceed those sought by the applicant and the applicant or their contractor would need to impose additional noise control measures. Tables 4-4, 4-5, and 4-6 are worst case scenario estimates that assume that the noisiest equipment will all be operating at full capacity.

#### 4. Time and duration of the emitted sound

As noted in the Background section of the decision the applicant is requesting a variance from 10 p.m. to 7 a.m. on weekdays and from 10 p.m. to 9 a.m. on weekends from the commencement of construction activity in 2004 through the completion of the project, currently estimated to occur in 2008.

#### 5. Geography, zoning and population density of the affected area

The three construction sites and the underground tunneling cover an area that is roughly rectangular in shape and approximately three to four blocks wide running north to south and eighteen blocks wide running west to east. Many properties within this seventy-two square block area would not be affected by the nighttime construction noise because they are not located near any of the proposed surface construction sites. The area covered by the rectangle runs from an area west of Interstate 5 and the west slope of Beacon Hill, across Beacon Hill, down the east slope of Beacon Hill and ends just east of Martin Luther King Jr. Way on the west slope of Mount Baker.

A variety of zoning is included within the area of the rectangle ranging from industrial on the west, to commercial on top of Beacon Hill and near Rainier Avenue and Martin Luther King Jr. Way, and residential mixed in throughout. Most of the residential uses are either single family or low to medium density multifamily.

#### 6. Danger to public health and safety

The effect of noise on humans is a matter of significant debate in some areas. The effects of noise on bodily functions other than hearing are one area of debate. It is generally accepted that very high levels of noise have adverse physical impacts on humans including, but not limited to, hearing damage. Many standards apply to occupational

exposures at high levels for prolonged periods of time. For example, the Occupational Safety and Health Act mandates a hearing conservation program by employers if sound levels exceed 85 dBA continuously over an 8-hour workday. If sound levels exceed 90 dBA continuously over an 8-hour workday hearing protection is required. The sound level limits in Table 4-3 of the Variance Application will maintain sound levels below the 85 dBA level, in a range where no hearing protection is required.

The amount of noise that can cause sleep disruption or deprivation can vary significantly from person to person. The results of the Federal Aviation Administration Report No. FAA-EE-85-2 titled *Aviation Noise Effects* show that 10% of the population studied experienced awakening from sleep at single-event maximum sound levels of 50 dBA and experienced a change in sleep state at single-event maximum sound levels of 39 dBA. Since typical northwest construction affords approximately 25 dBA of noise reduction between exterior and interior sound levels, the corresponding exterior sound levels producing sleep disturbance are single-event maximum sound levels of 75 dBA and 64 dBA, respectively. It should be noted that these studies involved aviation rather than construction noise and responses to construction noise may differ. An attempt was made to address the impact of short-duration single events by imposing sound level limits on the hourly L1 in addition to the hourly Leq.

The increases in nighttime noise levels that are sought by the applicant and the resulting noise levels will likely affect some people but are not expected to cause a danger to public health or safety.

#### 7. Relative interests of affected parties and the public

The interests of the applicant are described in the application. While the conditions imposed on this variance will require additional effort and flexibility on the part of the applicant, they are not expected to cause undue hardship. The residents most likely to be affected by the nighttime construction activities have indicated that they believe that they will suffer a general decrease in quality of life for the duration of the nighttime construction activity if the variance is granted. The preponderance of information suggests that the interests of the general public will be served by completion of this transportation project and by the expected shorter overall construction period if nighttime construction activity is allowed. If after approval of this variance request there is a clear demonstration that some individuals or the general public are suffering undue hardship or are endangered due to the nighttime construction noise, the Administrator may require additional noise mitigation after conferring with the applicant.

#### 8. Sound source:

The sound source does not predate the receivers.

#### 9. Hardship to the applicant

There is no practical means known or available for the adequate prevention, abatement or control of the type of noise proposed by the applicant such that the applicant's project may proceed to be built and at the same time remain within the sound level requirements imposed by the code on nighttime activities.

### **CONCLUSIONS**

1. Findings numbers 1 through 9 are adopted as Conclusion number 1.
2. Proper notice was given of the proposed variance and the required public hearings took place.
3. There are no practical means known or available for the adequate prevention, abatement or control of the noise from a number of the project's construction activities without increasing the danger to those working on the project and increasing the possibility of soils settlement.
4. Practical known and available mitigation measures for reducing the nighttime project sound levels and their effects on nearby residents are described in the application and will be incorporated into the project.
5. Based upon the written information submitted by the applicant and interested citizens, statements made at the public hearings, federal guidelines and the current body of scientific knowledge, there is no known danger to public health and safety if mitigating measures are put in place and followed, as provided in this Decision and Order.

### **DECISION AND ORDER**

This variance is **GRANTED** for the noise related to the construction activities and locations described in Findings 1 through 9.

1. Construction locations and activities not described in Findings 1 through 9 or construction activities not necessary to support tunneling, excavation, or other underground activity being performed at night are not covered by this nighttime noise level variance. This variance is subject to the conditions set forth below and to all requirements, specifications, standards, limits, and other mitigation measures identified by the applicant in their application. Specifically, the applicant is required to fully follow and execute all of the noise control measures identified in the application and its appendices with the additional requirements and limitations noted below.<sup>2</sup> If there is a

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<sup>2</sup> The following information is intended to clarify what appear to be typographical or reference errors in Section 3.1, 5.0 and Appendix B of the application. In Section 3.1 (East Portal Construction Site) the reference to the arrival of the TBM should refer to arrival at the East Portal. In Section 5.0 (Contractor Requirements) the reference to Table 7-1 in the section on Additional Noise Control Measures should read Table 5-1 and is changed to the same for purposes of this decision. Subsection 5.6 (Noise Monitoring Plan Guidelines) refers to Section 1564 of the Contract Specifications. The Administrator has been informed that this is a typographical error and should read Section 01565 and is changed to the same for purposes of this decision. Appendix B Figure 2 (Noise Measurement Report Form) indicates a noise measurement



conflict between the noise mitigation and control requirements or specifications of the application and this Decision and Order the requirements of this Decision and Order shall be followed.

2. Noise levels exceeding the ambient nighttime level will be allowed on a sliding scale from 0 to 5 dBA as set forth in the application for the three construction areas described therein on the following schedule:

Weekdays 10:00 p.m. to 7:00 a.m.

Weekends (including legal holidays) 10:00 p.m. to 9:00 a.m.

3. Commencement of the variance for the East Portal site commences when the tunnel boring machine breaks out after completing the first running tunnel.

4. The applicant shall notify the Administrator and the affected community two weeks prior to the commencement of activity that is subject to this variance. The form and content of the notification shall be proposed by the applicant and approved by the Administrator.

5. The Additional Noise Control Measures subsection of Section 5.2 Mandatory Noise Control Measures of the application is modified to prohibit the use of any public address systems during nighttime hours, except for emergency notifications.

6. Truck hauling from the Beacon Hill Station and East Portal construction sites is prohibited on weekends and holidays between the hours of midnight and 6:00 a.m..

7. This variance shall be reviewed within a one year period; or sooner if the Administrator reasonably determines that practical means for prevention, abatement or control of the noise becomes known or available. Should advanced or new techniques become available and known to the Administrator or the applicant to reduce the noise levels established herein during the course of the variance, the applicant shall confer promptly with the Administrator on use of the advanced techniques. A review of the variance shall take place at the end of each one-year period until completion of the construction, or sooner if the Administrator deems it necessary, in order to determine whether the noise levels established by this variance and the conditions imposed by this decision adequately protect the health and safety of the public. New conditions may be imposed at such times when necessary to protect the health and safety of the public.

8. Average nighttime noise levels will not exceed those proposed in the application. If the noise levels are exceeding the proposed levels, either the noise producing surface construction activity will cease or measures will be taken to promptly bring the noise level within the allowed limits, as soon as it is safe to do so. Representatives of the

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duration of fifteen minutes to one hour. The Execution section of Appendix B at Section 3.3.E.5 requires a minimum duration of twenty minutes. For purposes of this decision the applicant is expected to follow the requirements of Section 3.3.E.5 rather than the requirement stated in Figure 2.

applicant with authority to stop work will be present on the project site during all work hours to ensure that mitigation measures are being followed.

9. The applicant will make available to the affected public the services that are identified in Section 6.0 Citizen Involvement and Complaint Resolution of the application in addition to any other services required by this Decision and Order. Unless changed by this Decision and Order all requirements of Section 6.0 shall be followed.

10. Section 6.0 Subsection 6.4 (Documentation) of the application is changed for the purposes of this Order and Decision to require monthly reports to the Administrator for the first six months following the start of construction and bimonthly reports after that, unless informed otherwise by the Administrator. The Administrator may require additional reports if the Administrator believes a significant issue raised by a citizen complaint is not being resolved.

11. Section 6.0 Subsection 6.5 (Construction Hotline Procedures) of the application is changed for the purposes of this Order and Decision with the following requirements replacing those set forth in the application. A construction hotline will be available 24 hours a day, 7 days a week, including holidays. The hotline will be answered by a Sound Transit staff person Monday through Friday 8:00 a.m. to 5:00 p.m. At all other times (5:00 p.m. to 8:00 a.m.) calls will be forwarded to a pager. When the pager is in operation the applicant will respond by phone to the first page concerning each nighttime noise incident within ten minutes from the time the page is received. If an incident generates more than one page, the applicant will do their best to respond to the callers in a timely manner. If the Administrator determines that the pager system is not meeting the needs of the community in terms of responsiveness a phone line that is staffed during the noise variance hours may be required. There shall be staff on the project site at all times who have the authority to stop noise producing work if required by the Administrator or if the noise levels are not complying with the terms and conditions of this variance.

12. The applicant shall hold public meetings to gather and respond to citizen concerns about nighttime construction noise once a month for the first three months after construction subject to the variance commences and quarterly after that time unless the Administrator requires additional public meetings. The Administrator will only require additional public meetings if there are significant unresolved issues related to nighttime construction noise. The Administrator may also decide, at the end of the first year or thereafter, that quarterly meetings are no longer required. The method of providing notice and the location and time of the meetings will be proposed by the applicant and approved by the Administrator.

13. The duration of this variance shall not exceed sixty (60) months from the commencement of construction and in any event will expire on December 31, 2008, unless renewed pursuant to SMC 25.08.600.

14. Violation of any condition of this variance will result in a review of the policies and procedures of the application, imposition of new conditions, or possible revocation of this variance.

Dated this \_\_\_\_\_ day of August, 2003.

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Diane Sugimura, Director  
Department of Design, Construction and Land Use  
& Administrator, Chapter 25.08 of the Seattle Municipal Code

### **APPEAL**

The Noise Control Code SMC 25.08 provides that any person aggrieved by the denial, grant, or the terms and conditions on the grant of an application for a variance or renewal of a variance by the Administrator may appeal such decision to the City of Seattle Hearing Examiner pursuant to the provisions of the Seattle Municipal Code Section 25.08.610. The written notice of appeal shall include the following: the legal interest of the appellant in the property or equipment involved in the decision, a brief statement in concise language of the specific action protested, together with any material facts claimed to support the contentions raised in the appeal, a brief statement of the relief sought, and the reason why it is claimed that the protested action should be reversed, modified or otherwise set aside, the signatures of all parties named as appellants and their mailing addresses, the verification (by declaration under penalty of perjury) of at least one (1) appellant as to the truth of the matters asserted in the appeal is also required.

Appeals of this decision must be received by the Hearing Examiner no later than ten days following the date of the decision and be accompanied by a check for \$50.00 made payable to the City of Seattle.